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**United States Patent** [19]

Tyrrell et al.

[11] Patent Number: **5,185,736**[45] Date of Patent: **Feb. 9, 1993**[54] **SYNCHRONOUS OPTICAL TRANSMISSION SYSTEM**

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[52] U.S. Cl. .... 370/55; 370/84; 359/136

[58] Field of Search ..... 370/84, 4, 3, 55, 68; 455/600, 606, 607, 609, 613, 617, 618, 619

[56] **References Cited****U.S. PATENT DOCUMENTS**

4,858,232 8/1989 Diaz et al. .... 370/85.15  
4,872,157 10/1989 Hemmady et al. .... 370/58.1

**OTHER PUBLICATIONS**

Proceedings IEEE Global Telecommunications Conference, Tokio, 15-18, Nov. 1987, vol. 1, New York, US, pp. 485-489, N. B. Sandesara et al.: 'Synchronous Optical Network Format and Terminal Applications'.  
Proceedings IEE Global Telecommunications Conference, Hollywood, Fla., Nov. 28, and Dec. 1, 1988, vol. 2, New York, US, pp. 908-986—N. B. Sandesara et al.: 'SONET Intra Office Interconnect Signal'.

*Primary Examiner*—Douglas W. Olms*Assistant Examiner*—Melvin Marcelo*Attorney, Agent, or Firm*—Ware, Fressola, Van Der Sluys & Adolphson[57] **ABSTRACT**

A synchronous optical transmission system for interfacing SONET formatted channels to lower speed channels in either a SONET format or otherwise. The transmission system incorporates a fiber transmission system, terminal multiplexers and add/drop multiplexers that in turn incorporate a plurality of features, such as parallel scrambling circuitry, frame synchronization circuitry and the like.

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[51] Int. Cl.<sup>5</sup> ..... H04J 3/00; G02F 1/00

21 Claims, 43 Drawing Sheets

Microfiche Appendix Included  
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